syllabes caractérisant les trois sections coniques; d'où regulièrement ellidomoïde, paradomoïde et hyperdomoïde. D'autres figures, moins chargées, au contraire, que la pyramide, sont dites *trémoïdes*. Ce seront toujours, domoïdes et trémoïdes, des corps ou solides polygonaux, ou du moins considérés comme tels, et les rapports caractéristiques $\frac{2}{3}$, $\frac{1}{2}$, se constitueront le lien commun dans chacune des diverses familles. Ce sont choses que les curieux peuvent étudier dans mon ouvrage: *Théorie des Cristalloïdes*."

"Geometria renovata. Création d'une géométrie nouvelle, d'une morphologie architectonique. Geometria philosophica. Doctrine préexcellente; de même que le polygone engendre le cercle, de même les cristallo-domoïdes engendrent les sphéroïdes; geometria Hugo-domoidica sive Hugodomoidalis! geometria aspheristica! de même l'équidomoïde engendre la sphère!"

"Circulaire à messieurs les mathématiciens (on est très-poli dans cette géométrique-là):—'L'équidomoïde pré-archimédien a l'honneur d'informer votre seigneurie que par arrêté de S. E. le Commandeur Léopold Hugo, Président de la Géométrique Architectoni-primordiale, il a été nommé au poste occupé précédemment par la sphère, et qu'il s'y maintiendra envers et contre tous. L'équidomoïde espère que votre seigneurie voudra bien, ainsi que LL. AA. les Académies scientifiques, accueillir favorablement sa nomination et lui donner aide et appui contre les retours offensifs de la titulaire dépossédée. Il saisit cette occasion pour exprimer à votre seigneurie toutes les assurances de sa très-respectueuse consideration.

"'Equidopolis, le .'"

The motto is "Devise anti-archimédienne. L'equidomoïde va bien: le rebelle gagne du terrain! . . . . suppression de la sphère!"

We have, in a recent number of NATURE, given a sketch of a work by the same author. Now we let him speak for himself. When we say that there are "Placards singuliers," "Placards plus ou moins singuliers destinés à MM. les Elèves de Mathématiques (Pamphlet fantasia)," "Objurgation Hugodomoidale," "Inauguration Transatlantique,

"Yankee doodle went to town
Upon th' equidomody,
Cocked a feather to his hat
And called it cristallody!"

&c., &c., in many languages, we have furnished our readers with some idea of the two works before us. *Spectatum admissi, risum teneatis?*

Count Hugo is the author of at least six pamphlets; two more are in the press, and more in preparation, "and still they come."

Our latest acquisition is a sheet on "the Pan-imaginary theory (not the frying-pan)." "Here the space with $\frac{l}{m}$ dimensions gives birth, by its successive phases, to the *real space*, with $n$ dimensions, and specially to the *natural space* with three dimensions, and to the sub-natural space with two dimensions, &c."

## LETTERS TO THE EDITOR

*[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]*

### "The Recent Origin of Man"

THE letter of the author of the above work in NATURE, vol. xiii. p. 484, presents two points which demand an answer. 1. The reviewer is asked for his authority for the statement that palæolithic implements have been met with in Asia Minor. It is to be found in Evans' "Ancient Stone Implements," p. 571, and in Dawkins' "Cave-Hunting," p. 429. The discovery was made by the Abbé Richard between Mount Tabor and the Sea of Tiberias. 2. My opinion, which is also shared by some of the leading archæologists of Britain, that the interments at Solutré have not been proved to be palæolithic, has unfortunately evoked a charge of "ignorance and treacherous memory" from the author. I would merely remark that I am not ignorant of the account of Solutré in the "Matériaux," and in the "Archives du Muséum de Lyon," the latter of which is apparently unknown to the author, nor has my memory failed me concerning the debate on Solutré at the French Association, and the human skulls and implements which I then saw. Mr. Southall's argument as to the modern date of some of the reindeer, based on the percentage of gelatine in their bones, may be left to the tender mercies of Mr. Evans, and the comparison of the finely-chipped implements, with the Danish Neolithic finds, to those of M. de Mortillet, who takes them to be typical of one of the stages of the palæolithic period.

The discussion of the other questions raised in the letter, such as the Neolithic age of the *Rhinoceros hemitæchus* of the Gibraltar caves, or the reiterated assertion that the Irish Elk lived in Europe in the middle ages, is unnecessary in the present state of scientific inquiry. How an appeal to the mound at Hissarlik, to the discoveries at Alise, to the pile dwellings, to the food in the stomachs of fossil elephants and Mastodons, or to the recent elevation of Uddevalla can prove the "recent origin of man," may safely be reserved for decision to the judgment of the reader, without any comment from THE REVIEWER

### On the Formation of Coral Sand

IN the best books on geology one finds that the formation of coral sand is attributed to trituration by the force of the surf, the waste of shells and minute globigerinæ, and even to the droppings of those fishes which are said to browse upon the living coral.

While residing at Santa Cruz in the West Indies about this time last year, my friend Mr. Quin, inspector of schools there, first pointed out to me the great importance of a certain sea-weed in the formation of coral sand, and I had ample opportunity for verifying his observation while I stayed there.

A Coralline limestone is formed of coral blocks, consolidated coral-sand, and mud, shells, and myriad calcareous cases of minute organisms. Of these, next perhaps to the coral itself (of which I have seen great masses whose features were not quite effaced by percolation, &c., in the upheaved limestone of Santa Cruz), the bulkiest ingredient is the coral sand and mud, especially the sand, the shells and cases being of minor importance.

We are invariably taught, as far as I have seen, that coral sand is mainly formed of the trituration of the coral skeletons among each other, but it is difficult to see how this can be when one has seen both the sand and the skeletons, and the action of the surf which is mostly among the coral yet alive and cushioned with a vegetable matter. The coral skeleton is extremely hard and crystalline, and when two pieces of dead coral are rasped together by the action of the wave breaking over the reef they will triturate themselves into very fine grains. One can understand how the coral mud can be formed in this manner; but not so easily how the coral sand is formed. A glance at coral sand as it is seen forming the curving beaches in the pretty coves of the West Indian Islands shows that it is formed of *coarse* calcareous grains smoothed and rounded by the water, and of rather a soft friable nature, more like water-washed fragments of stucco or shell than crisp coral. On examining it more closely one sees that it is mainly composed of fragments and scales of soft calcareous matter of a mellow whiteness, and easily broken between the fingers. The larger of these scales have a peculiar shape, roughly like a half moon, whilst others are plainly only broken pieces of the larger.

Nor is the source of these far to seek. One finds everywhere strewed over the surface of the sand white bunches of a dead sea-weed, or rather of its calcareous skeleton, bleaching in the sunshine, every perfect leaf of which is one of these half-moon shaped scales, and all connected together by flax-like fibres. They have been cast ashore by high tides from the fringing reef. (See fig.)

In the reef itself, whilst sailing over it, one sees among the dark coral masses white sheets of coral sand, and when these are scrutinised more closely they prove to be almost entirely formed of these broken scales or leaf-skeletons.

One day I went with Mr. Quin to the outer edge of the reef at low water, and landed on its shoaling crest. Mr. Quin was provided with a very useful lens, wherewith to view the

"wonders of the deep," in the shape of a square wooden box with a glass bottom, which on being set on the water and looked through, obviated the surface ripple, and permitted a clear view into the coral caverns, some of which, by the way, were of great beauty, natural aquarium tanks, hoary with mosses and sea-blooms, floored with coral sand and shells, and tenanted by curious fishes of the most brilliant and varied hues.

The huge rounded bosses of green growing coral among which the surf-breaks resembled much the moss-covered granite-boulders of a boggy Scotch glen. Here we found banks and beds of the coral sand where it is formed at our very hands.

The scales and half scales were here in a most perfect state, and seemed to make up almost the entire mass of sand. It was easy now to see the principal source of coral sand—at least at Santa Cruz—and that what is seen on the beach is merely what is found out here in a more finely divided state.

Over all the reef about us, growing plentifully, was the living weed which supplies these scales—the vegetable tissue covering the calcareous interior being of a dull-green like the living coral itself. I procured a specimen of the growing weed, and also of the sand from these beds where it is first formed and from the beach; but unfortunately I have lost these. I can only send you some of the dried skeleton, and append a rough sketch of it for the benefit of readers. JOHN MUNRO

West Croydon

## Floating Radiometers

IN Mr. Crookes' paper reported in NATURE, vol. xiii. p. 489, occur the following words: "The envelope turned very slowly a few degrees in one direction, then stopped and turned a few degrees the opposite way." Assuming that this is rightly reported, it is inexplicable to me how Mr. Crookes could have written it. For, as the lawyers say, it is "void from ambiguity." The whole question between Mr. Crookes and Dr. Schuster appears to me to turn on the one point ignored by the former. When the rotation of the envelope began, in which direction was the first oscillation? To say that the envelope first turned in one direction and then in the other is simply to say that it oscillated, which, while it is a shorter mode of expressing the same thing, is an equally useless expression. The very nerve of the problem lies in the point omitted. If the first oscillation of the envelope was in the direction opposite to that of the mill, it is surely incontestable that the kick, which caused it, could not be the effect of any external force acting on the discs only.

Valentines, Ilford C. M. INGLEBY

## Preece and Sivewright's "Telegraphy"

IT is neither usual nor becoming for authors to question the judgment of a reviewer in dealing with their works, and although I think that in your number (vol. xiii. p. 441) you have treated the little work by Mr. Preece and myself with some severity, I do not propose to depart from this wholesome rule. Nevertheless, I think it but right to point out that the reason why the scientific part of the subject was so far left out was because this had been already dealt with in another work of the same series. Prof. Fleeming Jenkin's text-book on "Electricity and Magnetism" had appeared before that on "Telegraphy" was undertaken. In the former "the part of science" had been so ably treated that it became unnecessary and would have been out of place to go over the same ground in a practical text-book which was to appear in the same series. J. SIVEWRIGHT

## On the Nature of Musical Pipes having a Propulsive Mode of Action

IN the concluding paragraph of my last paper (NATURE, vol. xii., p. 146), I brought under notice the remarkable difference in the effect of increased diameter upon the two great classes of pipes, regarded by me as referable to the fact of the mass of air in the pipe being in the one class (that of pipes with reeds of wood or metal) under the influence of a propulsive current, and in the other class (that of pipes with reeds of air, or flue-pipes), under the influence of an abstracting current; the distinction thus manifested on the mode of action will, if clearly apprehended, enable us to reconcile many apparent anomalies in the behaviour of pipes perplexing to inquirers.

Considering a current simply as flowing, that is to say without the energy which the word propulsive implies, the nature of a tube or conduit is to cause friction between the walls of the tube and the particles of the substance flowing through the tube whether of air or of water. The friction of air upon air is also a calculable effect. In organ-pipes of the class now in question we have to recognise that we are dealing primarily with a current, with a true transport of air through a tube, a current propelled, abruptly arrested, and in a secondary stage converted into vibration; therefore all the conclusions arrived at concerning the propagation of waves of vibration in tubes are suggestively applicable here, and in practice we find these conclusions verified.

As regards ordinary tubes or conduits, Seebeck, following Regnault and Kundt, has shown (NATURE, vol. i. p. 456) that the effect of friction in retarding the velocity of a wave *in propagation* is not so insignificant as might be supposed; it is greatest upon those of tones of highest pitch, and it increases according as the diameters of the tubes are less. In musical pipes of the propulsive class exactly the same relations are preserved, and if two pipes of different diameters give the same pitch-note, then the pipe of larger diameter will prove to be of greater length, in fact the opposite of the law obtaining in pipes of the abstracting class. In a narrow pipe the friction is in excess, with an increased diameter the current gains greater freedom, and coincidently, that inner motion vibration is less impeded. Pipes of this class, for brevity here called propulsive in action, the trumpets, posaunes, bassoons, oboes, have this characteristic that the whole of the wind used passes through the body of the pipe and makes its exit at the upper orifice. In flue-pipes on the contrary the amount of wind actually passing up the interior of the pipe is scarcely noticeable. The form of trumpets and the like is conical, but the oboe has a special feature, its tube is very slender, slightly enlarging upward, until at the top it suddenly expands into a terminal shape called a bell. An actual comparison will afford the clearest illustration of the effect of form.

Two pipes of the standard pitch 256 vibrations per second:—

TRUMPET.
Sounding Mid C.

| | |
|---|---|
| Diameter at root of reed ... ... ... ... | $\frac{3}{8}$ in. |
| Diameter at upper orifice... ... ... ... | 3 ,, |
| Length from tip of reed ... ... ... ... | $23\frac{3}{8}$ ,, |

OBOE.
Sounding Mid C.

| | |
|---|---|
| Diameter at root of reed ... ... ... ... | $\frac{3}{8}$ in. |
| Diameter at upper orifice... ... ... ... | $\frac{3}{4}$ ,, |
| Length from tip of reed ... ... ... ... | $21\frac{1}{4}$ ,, (including bell) |

The oboe bell is not ordinarily reckoned in the effective length, yet it is not altogether to be disregarded; from its juncture at the tube and up to the rim 3 inches, with diameter expanding from $\frac{3}{4}$ to $1\frac{1}{2}$ inches. The influence of narrow bore will be best exhibited by comparing with these the orchestral oboe where the bore commences at $\frac{3}{16}$ and the note C is given by that portion without the bell, and which will measure from the finger hole to the tip of the reed only $19\frac{1}{4}$ inches. In the Chinese organ, or "Little Shang," which, when in proper condition is most perfect in relation of tube to pitch, the pipe sounding C octave above oboe measures $9\frac{5}{8}$ in length, including the beak, and the bore of the tube is barely $\frac{1}{4}$ inch, being cylindrical, not conical. The reed tongue is so very small that a larger bore would be disproportionate, the column of air seems well suited to the strength of the reed, the pitch does not quite accord with our organ or our concert pitch, but that will not affect the argument. What I am anxious to point out is that these varying relations of pipes result from a natural standard, which underlies all empirical changes. The true standard for all instruments of the propulsive